



**Actual Wellpath Report**  
 PEN-2M-HS AWP Proj: 16635'  
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REFERENCE WELLPATH IDENTIFICATION	
Operator	NOBLE ENERGY
Area	Ritchie County, WV
Field	Ritchie
Facility	PEN-2 Pad
Slot	Slot M
Well	PEN-2M-HS
Wellbore	PEN-2M-HS AWB

REPORT SETUP INFORMATION	
Projection System	NAD27 / Lambert West Virginia SP, Northern Zone (4701), US feet
North Reference	Grid
Scale	0.999953
Convergence at slot	0.96° West
Software System	WellArchitect® 4.0.1
User	Coftbral
Report Generated	9/23/2014 at 3:00:51 PM
Database/Source file	WANorthEast/PEN-2M-HS_AWB.xml

WELLPATH LOCATION			
	Local coordinates		Geographic coordinates
	North [ft]	East [ft]	
Slot Location	34.86	93.32	39°20'11.700"N 81°00'45.050"W
Facility Reference Pt	157213.09	308266.94	39°20'11.340"N 81°00'46.230"W
Field Reference Pt	0.00	0.00	38°17'12.460"N 86°28'23.077"W

WELLPATH DATUM	
Calculation method	Minimum curvature
Horizontal Reference Pt	Slot
Vertical Reference Pt	Nomac 78 (RKB)
MD Reference Pt	Nomac 78 (RKB)
Field Vertical Reference	Mean Sea Level
	Nomac 78 (RKB) to Facility Vertical Datum
	Nomac 78 (RKB) to Mean Sea Level
	Nomac 78 (RKB) to Mud Line at Slot (Slot.M)
	Section Origin
	Section Azimuth
	1101.01ft
	1101.01ft
	26.00ft
	N 0.00, E 0.00 ft
	140.03°

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# Actual Wellpath Report

PEN-2M-HS AWP Proj: 16635'

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## REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US Ft]	Grid North [US Ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [1/1000]
0.00†	0.000	190.590	0.00	0.00	0.00	0.00	1572206.41	308301.80	39°20'11.700"N	81°00'45.050"W	0.00	0.000	0.00
26.00	0.000	190.590	26.00	0.00	0.00	0.00	1572206.41	308301.80	39°20'11.700"N	81°00'45.050"W	0.00	0.000	0.00
49.88	0.160	190.590	49.88	0.02	-0.03	-0.01	1572206.40	308301.76	39°20'11.700"N	81°00'45.050"W	0.03	190.590	0.67
149.88	0.230	217.640	149.88	0.15	-0.33	-0.15	1572206.25	308301.47	39°20'11.697"N	81°00'45.055"W	0.36	205.138	0.11
249.88	0.350	197.690	249.88	0.36	-0.78	-0.37	1572206.04	308301.02	39°20'11.692"N	81°00'45.055"W	0.86	205.394	0.16
349.88	0.330	240.550	349.88	0.47	-1.21	-0.71	1572205.69	308300.59	39°20'11.688"N	81°00'45.059"W	1.41	210.490	0.25
449.88	0.340	235.430	449.87	0.39	-1.52	-1.21	1572205.20	308300.28	39°20'11.685"N	81°00'45.065"W	1.94	218.459	0.03
500.09	0.230	231.050	500.08	0.37	-1.67	-1.41	1572205.00	308300.13	39°20'11.683"N	81°00'45.068"W	2.18	220.176	0.22
600.00	0.180	258.180	599.99	0.30	-1.83	-1.72	1572204.69	308299.97	39°20'11.682"N	81°00'45.071"W	2.51	223.248	0.11
654.00	0.280	257.700	653.99	0.19	-1.87	-1.93	1572204.48	308299.92	39°20'11.681"N	81°00'45.074"W	2.69	225.873	0.19
682.00	0.110	258.500	681.99	0.15	-1.89	-2.02	1572204.38	308299.90	39°20'11.681"N	81°00'45.075"W	2.77	226.919	0.61
749.00	0.600	71.320	748.99	0.25	-1.79	-1.75	1572204.65	308300.00	39°20'11.682"N	81°00'45.072"W	2.51	224.378	1.06
800.00	3.530	86.220	799.95	1.27	-1.60	0.07	1572206.47	308300.19	39°20'11.684"N	81°00'45.049"W	1.61	177.674	5.79
842.00	6.170	89.510	841.80	3.47	-1.50	3.61	1572210.02	308300.30	39°20'11.686"N	81°00'45.004"W	3.91	112.543	6.32
896.00	9.130	89.580	895.31	8.04	-1.44	10.80	1572217.21	308300.35	39°20'11.688"N	81°00'44.912"W	10.90	97.613	5.48
991.00	9.210	92.560	989.10	17.98	-1.73	25.93	1572232.34	308300.07	39°20'11.687"N	81°00'44.720"W	25.99	93.812	0.51
1086.00	5.230	92.240	1083.33	26.05	-2.24	37.88	1572244.28	308299.56	39°20'11.684"N	81°00'44.568"W	37.94	93.381	4.17
1182.00	3.690	90.280	1179.03	30.99	-2.42	45.35	1572251.76	308299.37	39°20'11.684"N	81°00'44.472"W	45.42	93.060	1.63
1278.00	3.460	99.420	1274.84	35.19	-2.91	51.30	1572257.70	308298.88	39°20'11.680"N	81°00'44.397"W	51.38	93.250	0.64
1373.00	0.790	101.500	1369.77	37.88	-3.51	54.77	1572261.17	308298.28	39°20'11.674"N	81°00'44.352"W	54.88	93.670	2.81
1469.00	0.830	112.430	1465.76	39.01	-3.91	56.06	1572262.47	308297.89	39°20'11.671"N	81°00'44.336"W	56.20	93.990	0.17
1565.00	1.180	133.960	1561.75	40.61	-4.86	57.42	1572263.82	308296.94	39°20'11.662"N	81°00'44.318"W	57.62	94.840	0.53
1660.00	0.230	303.540	1656.74	41.38	-5.43	57.95	1572264.35	308296.37	39°20'11.656"N	81°00'44.311"W	58.20	95.350	1.50
1755.00	0.380	254.390	1751.74	41.06	-5.40	57.47	1572263.87	308296.40	39°20'11.656"N	81°00'44.318"W	57.72	95.365	0.30
1851.00	0.180	263.690	1847.74	40.84	-5.50	57.02	1572263.42	308296.30	39°20'11.655"N	81°00'44.323"W	57.28	95.509	0.21
1946.00	0.120	180.120	1942.74	40.83	-5.61	56.87	1572263.27	308296.18	39°20'11.654"N	81°00'44.325"W	57.14	95.639	0.22
2042.00	0.100	263.170	2038.74	40.86	-5.73	56.78	1572263.19	308296.07	39°20'11.653"N	81°00'44.326"W	57.07	95.758	0.15
2137.00	0.040	146.380	2133.74	40.85	-5.76	56.72	1572263.12	308296.03	39°20'11.652"N	81°00'44.327"W	57.01	95.802	0.13
2232.00	0.180	289.220	2228.74	40.76	-5.74	56.60	1572263.00	308296.06	39°20'11.653"N	81°00'44.329"W	56.89	95.793	0.22
2328.00	0.040	173.460	2324.74	40.66	-5.73	56.46	1572262.86	308296.07	39°20'11.653"N	81°00'44.330"W	56.75	95.790	0.21

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## REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS ["/1000]
2423.00	0.300	10.210	2419.74	40.52	-5.51	56.51	1572262.91	308296.28	39°20'11.65"N	81°00'44.330"W	56.77	95.573	0.36
2519.00	0.140	60.120	2515.74	40.38	-5.21	56.65	1572263.06	308296.59	39°20'11.65"N	81°00'44.328"W	56.89	95.252	0.25
2615.00	0.330	342.910	2611.74	40.15	-4.88	56.67	1572263.08	308296.91	39°20'11.66"N	81°00'44.328"W	56.88	94.926	0.34
2710.00	0.290	303.670	2706.73	39.41	-4.49	56.39	1572262.80	308297.31	39°20'11.66"N	81°00'44.331"W	56.57	94.552	0.22
2805.00	0.130	244.630	2801.73	39.41	-4.40	56.09	1572262.50	308297.39	39°20'11.66"N	81°00'44.335"W	56.27	94.488	0.26
2900.00	0.500	300.470	2896.73	38.99	-4.24	55.64	1572262.04	308297.56	39°20'11.66"N	81°00'44.341"W	55.80	94.357	0.46
2995.00	0.460	316.220	2991.73	38.22	-3.75	55.02	1572261.42	308298.04	39°20'11.67"N	81°00'44.349"W	55.15	93.903	0.14
3090.00	0.260	287.970	3086.73	37.66	-3.41	54.55	1572260.95	308298.39	39°20'11.67"N	81°00'44.355"W	54.66	93.579	0.28
3186.00	0.410	278.470	3182.73	37.22	-3.29	54.00	1572260.41	308298.50	39°20'11.67"N	81°00'44.362"W	54.10	93.490	0.17
3281.00	0.430	237.750	3277.72	36.91	-3.43	53.37	1572259.77	308298.36	39°20'11.67"N	81°00'44.370"W	53.48	93.682	0.31
3377.00	0.490	269.880	3373.72	36.60	-3.63	52.65	1572259.05	308298.17	39°20'11.67"N	81°00'44.379"W	52.78	93.941	0.27
3473.00	0.130	278.950	3469.72	36.26	-3.61	52.13	1572258.54	308298.19	39°20'11.67"N	81°00'44.386"W	52.26	93.962	0.38
3568.00	0.310	297.120	3564.72	35.94	-3.48	51.80	1572258.20	308298.32	39°20'11.67"N	81°00'44.390"W	51.91	93.840	0.20
3663.00	0.200	236.100	3659.72	35.68	-3.45	51.43	1572257.83	308298.34	39°20'11.67"N	81°00'44.395"W	51.55	93.840	0.29
3758.00	0.230	253.590	3754.72	35.59	-3.60	51.11	1572257.51	308298.20	39°20'11.67"N	81°00'44.399"W	51.24	94.028	0.08
3854.00	2.330	30.560	3850.69	34.86	-1.97	51.92	1572258.32	308299.82	39°20'11.68"N	81°00'44.389"W	51.96	92.176	2.61
3949.00	3.700	29.510	3945.56	33.14	2.36	54.41	1572260.81	308304.16	39°20'11.73"N	81°00'44.358"W	54.46	87.518	1.44
4045.00	6.860	37.800	4041.14	30.84	9.59	59.45	1572265.85	308311.38	39°20'11.80"N	81°00'44.296"W	60.22	80.840	3.38
4139.00	6.410	44.060	4134.51	29.11	17.79	66.54	1572272.94	308319.59	39°20'11.88"N	81°00'44.207"W	68.88	75.030	0.91
4234.00	9.020	47.420	4228.64	28.22	26.64	75.71	1572282.12	308328.44	39°20'11.97"N	81°00'44.092"W	80.26	70.613	2.79
4329.00	12.830	42.480	4321.91	26.49	39.47	88.33	1572294.73	308341.26	39°20'12.10"N	81°00'43.935"W	96.74	65.923	4.13
4424.00	16.980	37.620	4413.69	22.12	58.24	103.92	1572310.32	308360.04	39°20'12.29"N	81°00'43.740"W	119.13	60.732	4.56
4520.00	21.370	33.170	4504.35	14.03	84.00	122.06	1572328.46	308385.79	39°20'12.55"N	81°00'43.515"W	148.17	55.465	4.82
4615.00	22.190	38.940	4592.58	5.56	112.45	142.81	1572349.21	308414.24	39°20'12.83"N	81°00'43.257"W	181.76	51.783	2.41
4711.00	22.570	42.700	4681.35	-0.28	140.09	166.70	1572373.09	308441.88	39°20'13.11"N	81°00'42.959"W	217.74	49.957	1.54
4806.00	25.400	44.090	4768.14	-4.71	168.13	193.24	1572399.64	308469.91	39°20'13.39"N	81°00'42.627"W	256.14	48.976	3.04
4901.00	27.400	51.460	4853.25	-6.28	196.39	224.53	1572430.92	308498.18	39°20'13.67"N	81°00'42.235"W	298.30	48.825	4.04
4997.00	31.130	52.780	4936.99	-4.53	225.17	261.58	1572467.97	308526.96	39°20'13.96"N	81°00'41.770"W	345.15	49.277	3.94
5092.00	36.170	50.020	5016.05	-3.36	258.06	302.65	1572509.04	308559.85	39°20'14.30"N	81°00'41.254"W	397.73	49.546	5.54
5188.00	41.230	47.860	5090.95	-4.56	297.52	347.84	1572554.23	308599.30	39°20'14.69"N	81°00'40.687"W	457.72	49.459	5.45

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PEN-2M-HS AWP Proj: 16635'  
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**REFERENCE WELLPATH IDENTIFICATION**

Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

**WELLPATH DATA (181 stations)**

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]
5283.00	46.530	46.990	5159.40	-7.58	342.07	396.30	1572602.69	308643.85	39°20'15.146"N	81°00'40.080"W	523.51	49.201	5.61
5379.00	45.100	45.190	5226.31	-12.29	389.80	445.90	1572652.28	308691.58	39°20'15.626"N	81°00'39.459"W	592.26	48.840	2.01
5474.00	42.840	42.960	5294.68	-19.11	437.16	491.79	1572698.17	308738.93	39°20'16.102"N	81°00'38.885"W	658.00	48.366	2.88
5570.00	41.750	43.230	5365.69	-26.91	484.33	535.92	1572742.30	308786.10	39°20'16.575"N	81°00'38.334"W	722.35	47.895	1.15
5655.00	40.720	42.180	5429.61	-34.05	525.50	573.92	1572780.30	308827.27	39°20'16.989"N	81°00'37.859"W	778.16	47.522	1.46
5750.00	42.410	45.690	5500.70	-40.71	570.85	617.66	1572824.04	308872.62	39°20'17.444"N	81°00'37.312"W	841.06	47.256	3.03
5846.00	41.210	49.260	5572.26	-43.58	614.11	664.80	1572871.17	308915.87	39°20'17.879"N	81°00'36.722"W	905.03	47.270	2.78
5941.00	41.210	51.510	5643.73	-43.20	654.01	713.01	1572919.38	308955.77	39°20'18.282"N	81°00'36.117"W	967.53	47.471	1.56
6036.00	42.250	51.610	5714.63	-41.51	693.32	762.53	1572968.90	308995.08	39°20'18.678"N	81°00'35.495"W	1030.61	47.722	1.10
6132.00	42.210	53.210	5785.72	-38.83	732.68	813.66	1573020.02	309034.44	39°20'19.076"N	81°00'34.853"W	1094.92	47.998	1.12
6227.00	42.260	52.860	5856.05	-35.48	771.08	864.68	1573071.04	309072.84	39°20'19.464"N	81°00'34.212"W	1158.55	48.275	0.25
6322.00	49.930	60.390	5921.93	-27.35	808.41	921.87	1573128.23	309110.16	39°20'19.842"N	81°00'33.492"W	1226.12	48.752	9.88
6415.00	55.750	73.570	5978.24	-5.52	836.96	989.93	1573196.28	309148.72	39°20'20.136"N	81°00'32.632"W	1296.33	49.786	12.89
6510.00	56.770	78.210	6031.03	28.94	866.20	1066.51	1573272.87	309187.95	39°20'20.338"N	81°00'31.661"W	1367.67	51.243	4.20
6606.00	59.290	89.240	6081.96	74.10	864.97	1147.27	1573353.62	309166.72	39°20'20.438"N	81°00'30.636"W	1436.80	52.986	10.09
6701.00	58.780	104.400	6131.05	133.19	855.37	1227.80	1573434.15	309157.12	39°20'20.357"N	81°00'29.609"W	1496.38	55.136	13.68
6797.00	61.730	111.670	6178.73	203.84	829.52	1306.94	1573513.29	309131.27	39°20'20.115"N	81°00'28.596"W	1547.96	57.597	7.26
6892.00	70.720	114.840	6216.99	281.40	795.15	1386.69	1573593.03	309096.91	39°20'19.788"N	81°00'27.574"W	1598.49	60.169	9.94
6987.00	74.710	118.630	6245.22	364.69	754.34	1467.65	1573673.99	309056.10	39°20'19.398"N	81°00'26.535"W	1650.16	62.798	5.67
7083.00	76.930	123.420	6268.75	452.67	706.37	1547.37	1573753.70	309008.13	39°20'18.937"N	81°00'25.510"W	1700.97	65.464	5.36
7178.00	81.970	129.700	6286.16	543.42	650.75	1622.30	1573828.63	308952.51	39°20'18.400"N	81°00'24.545"W	1747.95	68.143	8.39
7274.00	85.840	135.870	6296.36	638.06	585.94	1692.30	1573898.62	308887.71	39°20'17.771"N	81°00'23.640"W	1790.86	70.902	7.55
7369.00	89.750	140.760	6300.02	732.90	515.08	1755.39	1573961.71	308816.85	39°20'17.082"N	81°00'22.822"W	1829.40	73.647	6.59
7464.00	89.480	141.370	6300.65	827.88	441.18	1815.09	1574021.41	308742.96	39°20'16.361"N	81°00'22.047"W	1867.94	76.338	0.70
7560.00	89.110	139.310	6301.84	923.86	367.29	1876.35	1574082.67	308669.07	39°20'15.641"N	81°00'21.251"W	1911.96	78.925	2.18
7655.00	89.110	138.700	6303.31	1018.84	295.59	1938.67	1574144.98	308597.38	39°20'14.943"N	81°00'20.443"W	1961.07	81.331	0.64
7751.00	88.830	139.920	6305.04	1114.81	222.81	2001.24	1574207.55	308524.60	39°20'14.234"N	81°00'19.631"W	2013.61	83.647	1.30
7846.00	88.800	139.720	6307.00	1209.79	150.25	2062.52	1574268.83	308452.04	39°20'13.527"N	81°00'18.836"W	2067.99	85.834	0.21
7942.00	88.520	140.130	6309.25	1305.76	76.81	2124.31	1574330.61	308378.60	39°20'12.812"N	81°00'18.034"W	2125.70	87.929	0.52
8038.00	88.460	139.560	6311.78	1401.73	3.46	2186.20	1574392.49	308305.26	39°20'12.097"N	81°00'17.231"W	2186.20	89.909	0.60

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Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

## WELLPATH DATA (181 stations)

MD [ft]	Incination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS ["/100ft]
8133.00	89.170	139.690	6313.74	1496.71	-68.90	2247.72	1574454.02	308232.90	39°20'11.392"N	81°00'16.433"W	2248.78	91.756	0.76
8229.00	89.690	138.200	6314.70	1592.68	-141.28	2310.77	1574517.06	308160.52	39°20'10.687"N	81°00'15.615"W	2315.08	93.499	1.64
8325.00	89.570	135.370	6315.32	1688.52	-211.24	2376.49	1574582.78	308090.57	39°20'10.007"N	81°00'14.764"W	2385.86	95.079	2.95
8420.00	89.480	139.260	6316.10	1783.39	-281.05	2440.89	1574647.17	308020.76	39°20'09.328"N	81°00'13.929"W	2457.01	96.568	4.10
8516.00	89.200	143.760	6317.21	1879.32	-356.17	2500.62	1574706.90	307945.64	39°20'08.595"N	81°00'13.153"W	2525.85	98.106	4.70
8611.00	89.450	142.830	6318.33	1974.16	-432.33	2557.39	1574767.67	307869.49	39°20'07.852"N	81°00'12.415"W	2593.68	99.595	1.01
8707.00	89.910	140.790	6318.87	2070.11	-507.78	2616.74	1574823.02	307794.05	39°20'07.116"N	81°00'11.643"W	2665.55	100.982	2.18
8803.00	89.850	142.610	6319.07	2166.06	-583.11	2676.24	1574882.51	307718.71	39°20'06.381"N	81°00'10.870"W	2739.03	102.292	1.90
8899.00	90.280	138.440	6318.96	2262.04	-657.20	2737.26	1574943.53	307644.63	39°20'05.659"N	81°00'10.078"W	2815.04	103.501	4.37
8995.00	90.580	140.140	6318.24	2358.02	-729.96	2799.87	1575006.14	307571.87	39°20'04.951"N	81°00'09.266"W	2893.46	104.612	1.80
9090.00	89.660	140.440	6318.94	2453.02	-803.04	2860.56	1575066.83	307498.79	39°20'04.239"N	81°00'08.478"W	2971.14	105.681	1.02
9185.00	89.660	143.280	6318.60	2547.96	-877.75	2919.22	1575125.49	307424.09	39°20'03.510"N	81°00'07.715"W	3048.33	106.735	2.99
9281.00	89.720	143.110	6319.12	2643.81	-954.62	2976.74	1575183.00	307347.23	39°20'02.760"N	81°00'06.967"W	3126.06	107.781	0.19
9377.00	89.690	142.170	6319.62	2739.71	-1030.92	3034.99	1575241.25	307270.93	39°20'02.015"N	81°00'06.210"W	3205.30	108.761	0.98
9472.00	89.850	136.720	6320.00	2834.67	-1103.07	3096.73	1575302.99	307198.78	39°20'01.313"N	81°00'05.409"W	3287.33	109.606	5.74
9567.00	90.280	132.640	6319.89	2929.24	-1169.85	3164.27	1575370.52	307132.00	39°20'00.664"N	81°00'04.535"W	3373.60	110.290	4.32
9662.00	90.150	132.750	6319.53	3023.46	-1234.27	3234.09	1575440.34	307067.58	39°20'00.039"N	81°00'03.633"W	3461.61	110.889	0.18
9758.00	90.090	133.540	6319.33	3118.77	-1299.92	3304.13	1575510.38	307001.94	39°19'59.401"N	81°00'02.728"W	3550.65	111.476	0.83
9853.00	89.450	140.080	6319.71	3213.56	-1369.15	3369.12	1575575.36	306932.72	39°19'58.728"N	81°00'01.886"W	3636.69	112.116	6.92
9949.00	89.600	142.690	6320.51	3309.52	-1444.15	3429.02	1575635.26	306857.72	39°19'57.997"N	81°00'01.108"W	3720.72	112.839	2.72
10043.00	89.690	140.750	6321.09	3403.48	-1517.93	3487.25	1575693.49	306783.94	39°19'57.277"N	81°00'00.351"W	3803.29	113.523	2.07
10138.00	89.140	145.040	6322.06	3498.33	-1593.68	3544.55	1575750.78	306708.20	39°19'56.538"N	80°59'59.606"W	3886.34	114.209	4.55
10232.00	89.570	148.340	6323.12	3591.68	-1672.22	3596.16	1575802.39	306629.66	39°19'55.771"N	80°59'58.933"W	3965.94	114.938	3.54
10328.00	89.750	150.050	6323.69	3686.45	-1754.67	3645.32	1575851.55	306547.21	39°19'54.964"N	80°59'58.290"W	4045.64	115.704	1.79
10423.00	90.830	146.110	6323.21	3780.49	-1835.28	3695.54	1575901.76	306466.60	39°19'54.175"N	80°59'57.634"W	4126.17	116.410	4.30
10518.00	90.890	142.560	6321.78	3875.20	-1912.45	3750.91	1575957.13	306389.44	39°19'53.422"N	80°59'56.913"W	4210.32	117.015	3.74
10613.00	90.030	142.190	6321.02	3970.11	-1987.68	3808.90	1576015.13	306314.21	39°19'52.688"N	80°59'56.159"W	4296.35	117.558	0.99
10707.00	90.980	138.870	6320.19	4064.09	-2060.23	3868.65	1576074.86	306241.66	39°19'51.981"N	80°59'55.383"W	4383.03	118.410	3.67
10803.00	90.920	132.510	6318.60	4159.75	-2128.88	3935.66	1576141.88	306173.02	39°19'51.314"N	80°59'54.516"W	4474.55	118.410	6.62
10897.00	89.850	127.290	6317.97	4252.25	-2189.16	4007.75	1576213.96	306112.75	39°19'50.730"N	80°59'53.586"W	4566.67	118.645	5.67

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# Actual Wellpath Report

PEN-2M-HS AWP Proj: 16635'

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## REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

## WELLPATH DATA (181 stations)

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]
10992.00	89.510	126.480	6318.50	4344.76	-2246.18	4083.73	1576289.94	306055.73	39°19'50.179"N	80°59'52.607"W	4660.70	118.812	0.92
11086.00	89.600	129.810	6319.23	4436.73	-2304.23	4157.63	1576363.85	305997.68	39°19'49.617"N	80°59'51.654"W	4753.47	118.996	3.54
11182.00	90.000	133.140	6319.56	4531.65	-2367.80	4229.56	1576435.76	305934.12	39°19'49.001"N	80°59'50.726"W	4847.23	119.241	3.49
11277.00	90.460	145.340	6319.18	4626.46	-2439.62	4291.47	1576497.67	305862.30	39°19'48.302"N	80°59'49.923"W	4936.44	119.617	12.85
11373.00	90.000	145.970	6318.79	4721.99	-2518.88	4345.63	1576551.82	305783.04	39°19'47.527"N	80°59'49.217"W	5022.87	120.098	0.81
11468.00	90.340	141.470	6318.51	4816.77	-2595.44	4401.83	1576608.02	305706.48	39°19'46.780"N	80°59'48.485"W	5110.03	120.525	4.75
11564.00	90.310	141.000	6317.97	4912.75	-2670.29	4461.94	1576668.12	305631.63	39°19'46.050"N	80°59'47.705"W	5199.94	120.899	0.49
11659.00	90.180	139.690	6317.56	5007.74	-2743.43	4522.56	1576728.75	305558.50	39°19'45.337"N	80°59'46.918"W	5289.61	121.241	1.39
11754.00	90.340	140.080	6317.13	5102.74	-2816.08	4583.77	1576789.95	305485.85	39°19'44.629"N	80°59'46.124"W	5379.71	121.565	0.44
11850.00	90.280	136.210	6316.61	5198.67	-2887.57	4647.81	1576853.99	305414.36	39°19'43.933"N	80°59'45.294"W	5471.77	121.852	4.03
11945.00	90.150	136.280	6316.25	5293.46	-2956.19	4713.51	1576919.69	305345.75	39°19'43.266"N	80°59'44.443"W	5563.83	122.095	0.16
12040.00	89.570	138.760	6316.49	5388.36	-3026.25	4777.66	1576983.84	305275.70	39°19'42.584"N	80°59'43.612"W	5655.46	122.351	2.68
12136.00	89.850	144.080	6316.97	5484.30	-3101.27	4837.51	1577043.68	305200.68	39°19'41.853"N	80°59'42.835"W	5746.24	122.663	5.55
12230.00	89.910	147.110	6317.17	5577.85	-3178.81	4890.61	1577096.78	305123.14	39°19'41.095"N	80°59'42.143"W	5832.92	123.023	3.22
12324.00	90.180	146.380	6317.10	5671.20	-3257.42	4942.16	1577148.33	305044.54	39°19'40.327"N	80°59'41.470"W	5919.10	123.389	0.83
12419.00	90.490	146.040	6316.54	5765.65	-3336.37	4994.99	1577201.16	304965.59	39°19'39.555"N	80°59'40.781"W	6006.77	123.741	0.48
12514.00	90.310	142.940	6315.88	5860.35	-3413.69	5050.17	1577256.33	304888.27	39°19'38.800"N	80°59'40.063"W	6095.69	124.057	3.27
12609.00	90.250	140.150	6315.41	5955.30	-3488.08	5109.24	1577315.40	304813.89	39°19'38.075"N	80°59'39.295"W	6186.36	124.321	2.94
12704.00	90.490	140.220	6314.80	6050.30	-3561.05	5170.07	1577376.22	304740.92	39°19'37.364"N	80°59'38.506"W	6277.79	124.558	0.26
12799.00	90.400	141.170	6314.06	6145.29	-3634.55	5230.24	1577436.39	304667.42	39°19'36.647"N	80°59'37.725"W	6369.10	124.796	1.00
12895.00	90.460	142.090	6313.34	6241.25	-3709.82	5289.83	1577495.98	304592.16	39°19'35.913"N	80°59'36.951"W	6461.04	125.042	0.96
12990.00	90.400	141.270	6312.63	6336.20	-3784.35	5348.73	1577554.88	304517.63	39°19'35.186"N	80°59'36.185"W	6552.12	125.280	0.87
13085.00	90.430	140.230	6311.94	6431.19	-3857.91	5408.84	1577614.98	304444.07	39°19'34.469"N	80°59'35.405"W	6643.72	125.499	1.10
13181.00	90.770	138.190	6310.93	6527.17	-3930.59	5471.55	1577677.69	304371.40	39°19'33.761"N	80°59'34.592"W	6737.01	125.692	2.15
13276.00	90.120	136.590	6310.20	6622.07	-4000.50	5535.86	1577742.00	304301.49	39°19'33.081"N	80°59'33.759"W	6830.06	125.854	1.82
13372.00	90.090	134.600	6310.02	6717.77	-4069.08	5603.03	1577809.16	304232.92	39°19'32.414"N	80°59'32.890"W	6924.69	125.988	2.07
13468.00	89.690	138.450	6310.21	6813.58	-4138.73	5669.07	1577875.20	304163.27	39°19'31.737"N	80°59'32.035"W	7019.07	126.131	4.03
13563.00	90.090	143.650	6310.39	6908.53	-4212.59	5728.77	1577934.90	304089.42	39°19'31.017"N	80°59'31.260"W	7110.88	126.328	5.49
13658.00	89.510	142.100	6310.72	7003.41	-4288.33	5786.10	1577992.23	304013.68	39°19'30.278"N	80°59'30.514"W	7202.00	126.544	1.74
13754.00	90.000	141.960	6311.13	7099.35	-4364.01	5845.17	1578051.29	303938.00	39°19'29.540"N	80°59'29.747"W	7294.55	126.745	0.53

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# Actual Wellpath Report

PEN-2M-HS AWP Proj: 16635'  
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## REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]
13849.00	90.000	143.080	6311.13	7194.26	-4439.39	5902.97	1578109.09	303862.62	39°19'28.804"N	80°59'28.995"W	7386.02	126.945	1.18
13945.00	89.940	142.610	6311.18	7290.14	-4515.91	5960.95	1578167.07	303786.11	39°19'28.057"N	80°59'28.241"W	7478.39	127.147	0.49
14040.00	89.970	141.430	6311.25	7385.08	-4590.79	6019.41	1578225.53	303711.23	39°19'27.327"N	80°59'27.482"W	7570.25	127.331	1.24
14134.00	89.060	140.740	6311.23	7479.06	-4663.93	6078.46	1578284.57	303638.10	39°19'26.614"N	80°59'26.715"W	7661.58	127.499	0.74
14230.00	89.510	139.170	6311.59	7575.06	-4737.41	6140.22	1578346.33	303564.61	39°19'25.898"N	80°59'25.914"W	7755.35	127.652	1.73
14325.00	90.150	140.620	6311.87	7670.06	-4810.07	6201.42	1578407.52	303491.96	39°19'25.190"N	80°59'25.120"W	7848.21	127.799	1.67
14421.00	90.180	141.720	6311.60	7766.04	-4884.86	6261.61	1578467.71	303417.18	39°19'24.461"N	80°59'24.338"W	7941.64	127.959	1.15
14515.00	90.090	141.030	6311.37	7860.01	-4958.29	6320.29	1578526.39	303343.74	39°19'23.745"N	80°59'23.576"W	8033.10	128.114	0.74
14611.00	90.150	139.560	6311.17	7956.00	-5032.15	6381.61	1578587.71	303269.89	39°19'23.025"N	80°59'22.780"W	8126.96	128.257	1.53
14706.00	90.520	137.190	6310.62	8050.96	-5103.16	6444.71	1578650.80	303198.89	39°19'22.333"N	80°59'21.963"W	8220.49	128.373	2.52
14801.00	90.000	133.470	6310.19	8145.62	-5170.70	6511.49	1578717.58	303131.34	39°19'21.677"N	80°59'21.099"W	8314.78	128.453	3.95
14896.00	89.480	134.290	6310.62	8240.07	-5236.55	6579.96	1578786.05	303065.50	39°19'21.037"N	80°59'20.214"W	8409.36	128.514	1.02
14990.00	89.380	137.580	6311.55	8333.81	-5304.08	6645.32	1578851.41	302997.97	39°19'20.381"N	80°59'19.368"W	8502.56	128.596	3.50
15084.00	89.480	139.910	6312.49	8427.78	-5374.74	6707.30	1578913.38	302927.32	39°19'19.693"N	80°59'18.565"W	8595.10	128.706	2.48
15180.00	89.350	139.310	6313.47	8523.77	-5447.86	6769.50	1578975.58	302854.21	39°19'18.980"N	80°59'17.758"W	8689.38	128.826	0.64
15275.00	89.510	141.820	6314.41	8618.75	-5521.22	6829.84	1579035.91	302780.85	39°19'18.265"N	80°59'16.975"W	8782.40	128.952	2.65
15370.00	89.420	141.990	6315.30	8713.70	-5595.98	6888.45	1579094.52	302706.09	39°19'17.536"N	80°59'16.213"W	8875.01	129.089	0.20
15466.00	89.480	142.450	6316.22	8809.62	-5671.85	6947.26	1579153.33	302630.22	39°19'16.796"N	80°59'15.449"W	8968.52	129.229	0.48
15562.00	89.480	142.200	6317.09	8905.54	-5747.83	7005.93	1579212.00	302554.24	39°19'16.054"N	80°59'14.687"W	9062.04	129.366	0.26
15658.00	89.480	139.370	6317.96	9001.52	-5822.20	7066.62	1579272.68	302479.88	39°19'15.329"N	80°59'13.899"W	9156.15	129.485	2.95
15754.00	89.200	143.150	6319.07	9097.47	-5897.06	7126.68	1579332.74	302405.02	39°19'14.599"N	80°59'13.119"W	9250.13	129.606	3.95
15850.00	89.910	146.900	6319.82	9193.09	-5975.71	7181.69	1579387.75	302326.38	39°19'13.831"N	80°59'12.403"W	9342.69	129.763	3.98
15947.00	89.850	138.560	6320.02	9289.90	-6052.83	7240.38	1579446.44	302249.26	39°19'13.079"N	80°59'11.640"W	9437.15	129.895	8.60
16041.00	89.820	136.780	6320.29	9383.81	-6122.32	7303.68	1579509.73	302179.78	39°19'12.402"N	80°59'10.820"W	9530.29	129.971	1.89
16136.00	89.910	136.970	6320.51	9478.67	-6191.66	7368.62	1579574.67	302110.44	39°19'11.728"N	80°59'09.979"W	9624.61	130.039	0.22
16231.00	89.910	138.290	6320.66	9573.58	-6261.84	7432.64	1579638.68	302040.26	39°19'11.045"N	80°59'09.150"W	9718.79	130.113	1.39
16326.00	89.820	141.430	6320.89	9668.57	-6334.46	7493.87	1579699.92	301967.65	39°19'10.337"N	80°59'08.355"W	9812.42	130.207	3.31
16422.00	90.250	141.670	6320.83	9764.54	-6409.64	7553.57	1579759.61	301892.47	39°19'09.604"N	80°59'07.580"W	9906.56	130.317	0.51
16518.00	91.080	138.070	6319.71	9860.51	-6483.02	7615.43	1579821.47	301819.09	39°19'08.889"N	80°59'06.778"W	10001.22	130.408	3.85
16612.00	89.540	133.690	6319.21	9954.24	-6550.48	7680.85	1579886.88	301751.63	39°19'08.233"N	80°59'05.931"W	10094.76	130.459	4.94

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# Actual Wellpath Report

PEN-2M-HS AWP Proj: 16635'

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## REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot M
Area	Ritchie County, WV	Well	PEN-2M-HS
Field	Ritchie	Wellbore	PEN-2M-HS AWB
Facility	PEN-2 Pad		

## WELLPATH DATA (181 stations)

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]
16635.00	89.540	133.690	6319.39	9977.10	-6566.37	7697.48	1579903.51	301735.75	39°19'08.078"N	80°59'05.716"W	10117.73	130.466	0.00

## TARGETS

Name	MD [ft]	TVD [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Shape
PEN-2M-HS BHL Rev-		6298.00	-6774.48	7862.37	1580068.39	301527.65	39°19'06.049"N	80°59'03.575"W	point
PEN-2M-HS BHL Rev-2		6298.00	-6570.64	7691.47	1579897.50	301731.48	39°19'08.035"N	80°59'05.792"W	point
PEN-2M-HS LP Rev-2		6298.00	613.85	1668.31	1573874.64	308915.62	39°20'18.043"N	81°00'23.951"W	point
PEN-2 Pad LL		6999.55	-34.86	-93.32	1572113.09	308266.94	39°20'11.340"N	81°00'46.230"W	polygon

## WELLPATH COMPOSITION - Ref Wellbore: PEN-2M-HS AWB Ref Wellpath: PEN-2M-HS AWP Proj: 16635'

Start MD [ft]	End MD [ft]	Positional Uncertainty Model	Log Name/Comment	Wellbore
26.00	500.09	Generic gyro - northseeking (Standard)	01 Gyrodatta MS Gyro <17-1/2"> (49.88'-500.09')	PEN-2M-HS AWB
500.09	5570.00	NavitTrak (MaxCorr)	02 BHI MWD <12-1/4"> (500.09')(600'-5570') Prof: 5648'	PEN-2M-HS AWB
5570.00	16612.00	NavitTrak (AT Curve Short Spaced)	03 BHI AT Curve <8-3/4"> (5570')(5655'-16612')	PEN-2M-HS AWB
16612.00	16635.00	Blind Drilling (std)	Projection to bit	PEN-2M-HS AWB

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**Actual Wellpath Report**  
 PEN-2M-HS AWP Proj: 16635'  
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**REFERENCE WELLPATH IDENTIFICATION**

Operator	Area	Field	Facility	Slot	Well	Wellbore	Slot M
NOBLE ENERGY	Ritchie County, WV	Ritchie	PEN-2 Pad				PEN-2M-HS
							PEN-2M-HS AWB

**COMMENTS**

Wellpath general comments  
 API: 47-085-10066-0000  
 BHI Job #: 6651408  
 Rig: Nomac 78  
 Duration: 09/11/2014 - 09/21/2014  
 Gyrodatta MS Gyro <17-1/2"> (49.88'-500.09')  
 BHI MWD <12-1/4"> (500.09')(600'-5570')  
 BHI AT Curve <8-3/4"> (5570')(5655'-16612')  
 Projected MD at TD: 16635'

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# NOBLE ENERGY

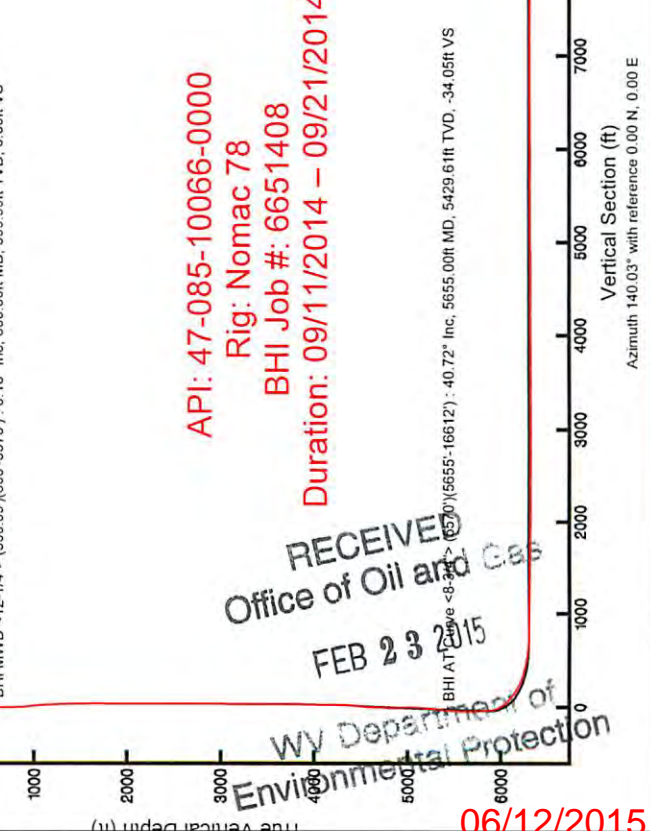


Location: Ritchie County, WV  
 Field: Ritchie  
 Facility: PEN-2 Pad

Slot: Slot M  
 Well: PEN-2M-HS  
 Wellbore: PEN-2M-HS PWB

Plot reference wellbore is PEN-2M-HS PWB Rev-B.0			
True vertical depths are referenced to Nomac 78 (RKB)			
Measured depths are referenced to Nomac 78 (RKB)			
Nomac 78 (RKB) to Mean Sea Level: 1101.01 feet			
Mean Sea Level to Mud line (At Slot, Slot M): -1075.01 feet			
Coordinates are in feet referenced to Slot			
Created by: gbfw@ on 02/20/14			
Location Information			
Facility Name	Grid East (US ft)	Grid North (US ft)	Longitude
PEN-2 Pad	1572113.090	308266.940	81°00'46.230"W
Slot	Local N (ft)	Local E (ft)	Longitude
Slot M	34.86	93.32	81°00'45.050"W
Nomac 78 (RKB) to Mud line (At Slot, Slot M)			
Mean Sea Level to Mud line (At Slot, Slot M)			
Nomac 78 (RKB) to Mean Sea Level			

BHI AT Curve <8-3/4"> (5570)(5655-16612) : 5429.61ft TVD, 525.50ft N, 573.92ft E  
 Slot M  
 BHI MWD <12-1/4"> (500.09)(600-5570) : 599.99ft TVD, 1.83ft S, 1.72ft W  
 Gyrodatta MS Gyro <17-1/2"> (49.88-500.09) : 49.88ft TVD, 0.03ft S, 0.01ft W



API: 47-085-10066-0000  
 Rig: Nomac 78  
 BHI Job #: 6651408  
 Duration: 09/11/2014 - 09/21/2014

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